SURVEY OF PROJECT MANAGEMENT METHODS WHICH EMPLOYED BY FIXED POSITION LAYOUT IN MALAYSIA

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ABSTRACT

This thesis presents the survey on the project management methods which employed in fixed-position layout in Malaysia. The objectives of this research are to investigate the type of project management methodology and tools, the factors considered in project management methods and the performance of project management methods implemented in fixed- position layout (construction) in Malaysia. A questionnaire survey about project management methods were conducted at construction companies. Critical path method (CPM), Program Evaluation & Review Technique (PERT) and graphical evaluation & review technique (GERT) have been chosen as predictors in order to predict which project management method most suitable to be employed in fixed-position layout. The survey shows that the most significant method is CCPM and for tools is PERT followed by CPM and lastly GERT. CPM and PERT analysis were implemented to one of the construction project. As a conclusion, by having a good project management system such as CPM and PERT, the fixed position layout industry can strive for better improvement, redefine its image and steer itself in meeting a success in near future.

ABSTRAK

Tesis ini membentangkan kajian mengenai cara pengurusan projek yg digunakan di 'fixed position layout' di Malaysia. Objektif tesis ini adalah mengkaji kaedah-kaedah pengurusan projek yang digunakan di 'fixed position layout' di Malaysia. 'Critical path method' (CPM), 'Program Evaluation and Review Technique' (PERT) dan 'Graphical Evaluation and Review Technique' (GERT) digunakan sebagai parameter untuk meramalkan kaedah pengurusan projek paling sesuai untuk diaplikasikan di 'fixed position layout'. Kaji selidik diedarkan kepada beberapa buah syarikat pembinaan di Malaysia untuk mengetahui kaedah pengurusan projek yang digunakan dalam sesebuah organisasi. Analysis dari kaji selidik ini menunjukkan bahawa kaedah yang paling sesuai ialah PERT diikuti dengan CPM dan GERT. CPM dan PERT dilaksanakan di salah sebuah projek pembinaan. Keputusan yang diperolehi dalam kajian ini sangat berguna untuk diimplementasikan dalam 'fixed position layout' untuk meningkatkan prestasi syarikat dari segi pengurusan projek. Kesimpulannya, dengan mempunyai sistem pengurusan projek baikseperti CPM and PERT, industri 'fixed position layout' boleh berusaha untuk peningkatan lebih baik, mentakrifkan semula imejnya dan memandu sendiri dalam memenuhi satu kejayaan di masa hadapan.

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LIST OF ABBREVIATION

CPM	Critical Path Method
PERT	Program Evaluation and Review Technique
GERT	Graphical Evaluation and Review Technique
CCPM	Critical Chain Project Management
ECM	Event- Chain Methodology
WBS	Work-Breakdown Structure
CRAFT	Computerized Relative Allocation of Facilities Technique
SLP	Systematic Layout Planning
TQM	Total Quality Management
PmBoK	Project Management body of Knowledge
PMI	Project Management Institute
SPMIS	Smart Project Management Information System
SA	Simulation Annealing
ACO	Colony Optimization
EA	Evolutionary Algorithm
GA	Genetic Algorithm
PSO	Particle Swarm Optimization
SFL	Shuffled frog-leaping

QA/QC	Quality Assurance / Quality Control
NIL	No Methodology
HRM	Human Resource Management
PM	Project Management
GC	Gantt Chart
GCL	Gantt Chart with Link
RAM	Risk Assessment Matrix
RM	Responsibility Matrix
RE	Resource Estimate
PR	Progress Report
ISO	International Organization for Standardization
CM	A standard developed in-house
TN	Traditional approach
P1/P2	PRINCE 1 / PRINCE 2
PB	Process-Based Management
AP	Agile Project Management
t_e	Expected time
t_o	Optimistic time
t_m	Most probable activity time
t_p	Pessimistic time

s_1 / s.d.	Standard deviation
ES	Early start
EF	Early finish
LS	Late start
LF	Late finish
Var.	Variance
VT	Variance time
ST	Standard time

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

As we know, fixed position layout is used when the product is too big and heavy to move. Although the fixed position layout has advantages such as flexibility, it also has disadvantages such as high capital investment, space and time constraint and etc. Thus, project management is the most important factor needed in fixed position layout to overcome the problems and risks.

1.2 PROJECT BACKGROUND

Today, the changes organizations faced have no precedent. The continuity of an organization is depending on its capability to compete effectively. Thus, projects are the block in the design and execution of strategies for an organization to compete effectively. Project management provides an organizational focus for conceptualizing, designing and creating new or improved product, services, and organizational processes. In order to success, organizations must cope with legal, social, economic, and technological changes as well as changes brought about by competitors' advances and new needs of customers. Project management has emerged as a crucial factor that determines the success of an organization. It plays a pivotal role in the growth of a firm, whether the firms facing an economic crisis or generating a large turnover.

Generally, project management is defined as the discipline of planning, organizing, securing, and managing resources to achieve specific goals. Any project should aim for these three basic principles of project management that are delivering on time, delivering within the specified budget and delivering products that are the right quality and meets the customers' needs. Thus, it can be concluded that project management is having three components: time, money, and scope. Reducing or increasing any one of the three will probably have an impact on the other two. For example, if a company reduces the amount of time it can spend on a project, that will affect the scope (what can be included in the project) and the cost (for additional people or resources may be required to meet the abbreviated schedule).

Essentially, even today, the challenges of fixed position layout are mainly focused on the achievement of complete the product on time, delivering on time, delivering within the specified budget and meets the customers' needs. Furthermore, the construction industry is one of the most dynamic, risky, and challenging business. Thus, project management is the most important factor in a organization to achieve their objectives and goals. Critical path methods(CPM) and risk management are considered the suitable method to manage construction projects. While, program evaluation and review technique(PERT), graphical evaluation and review technique (GERT) and Gantt chart are the best project management tools for construction firms.

There is very little knowledge about project management practices in Malaysia. Thus, this study is conducted to investigate what types of project management methodology and tools mostly implemented in fixed position layout and which is the most suitable method and tool for fixed position layout in Malaysia, the factors considered in project management for fixed position layout. Besides, the project also focused on project management methodology and tools to predict the organization performances.

1.3 PROBLEM STATEMENTS

The challenges in fixed-position layout such as high capital investment because of the duration to complete a product are too long. Besides, the space constraint for the storage of material and equipment is also large. Thus, considering the existing problems and unexpected problems, it requires effective project management methods and focused attention on the critical activities. Otherwise, confusion, delaying and conflict may arise.

Besides, the factors that should be considered in project management must be investigate to know the most suitable type of project management method employed in fixed position layout. Moreover, to investigate whether the project management methods can develop and enhance the quality and effectiveness of the fixed position layout firms and what are the factors should be considered to implement the project management method to the fixed position layout in Malaysia, this project was conducted.

1.4 OBJECTIVES

The objectives of this research are as follows:

i. To find out the type of project management methodology and tools employed in fixed-position layout(construction) in Malaysia.

ii. To find out the most considered deliverables in project management methods.

iii. To evaluate the performance of project management methods.

1.5 SCOPE OF STUDY

i A questionnaire survey was carried out in five Construction firms.

ii The questions are based on the project management methodologies and tools, project management deliverables and performance.

iii One of the project were analyzed and CPM and PERT were implemented using the Microsoft Project Software.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The Project Management Institute provides a simplified definition of project management as ‘‘the application of knowledge, skills, tools, and techniques to project requirements’’ (Murphy, A. and Ledwith, A., 2007). As mentioned by Theodosiou and Sapidis (2004), complex products and systems, like an aircraft, ship, or machinery plant, involve a large number of components which are arranged under spatial constraints/relationships in design space. Any task that requires some preparation to achieve a successful outcome, will probably be done better by using a few project management methods somewhere in the process. Project management methods can help in the planning and managing of all sorts of tasks, especially complex activities (Chapman, 1995). Thus, project management is important for an organization to manage and arranged the projects.

2.2 PROJECT MANAGEMENT

Project management is a well-established discipline that defines in detail the tools and techniques that are required to define, plan, and implement any project. According to White and Fortune, project management offers a systematic approach to all stages of a project by ensuring that every step is carefully planned, monitored, and measured (Murphy, A. and Ledwith, A., 2007). Gale and Brown (2003) agreed with the statement by saying

that the project management competencies are the capability to manage projects professionally, by applying best practices regarding the design of the project management process, and the application of project management methods.

Moreover, Alan Murphy and Ann Ledwith (2007) also concluded that the emergence of modern project management owes to three core stimuli, which are complexity, change and time. Complexity is defined as the growing complexity of tasks and a need for a greater degree of specialization. Change means an increasingly dynamic environment with constant pressure within organizations to implement change due to global competition and time means the demand for tasks to be completed as quickly as possible.

Mohanty and Tungare (2007) also said that the size, scope and duration as well as the complexity of the project can be varied from a small, personal project of a single day's duration to a complex, organization-wide transformational project spanning multiple years and requiring hundreds, or even thousands, of people. Furthermore, regardless of its type (linear or nonlinear), scale (small or large),and duration (short or long), each project generally has three objectives to meet, i.e., performance (with respect to the specification),time, and cost (Liao, T. W. et al., 2011).

There are a number of approaches to managing project activities including Traditional phased approach, Agile Project Management approaches, Process-Based Management approaches, Critical Chain Project Management (CCPM), Event-Chain Methodology (ECM), and others. While, Critical Path method (CPM), Program Evaluation and Review Technique (PERT), Graphical Evaluation and Review Technique (GERT), Critical, Gantt chart, work-breakdown structure(WBS) are some of the project management tools that help in managing the project.

Traditional project management is a step-by-step approach through each of the project's five stages – initiation, planning, execution, monitoring, and completion(as shown in Figure 2.1). Each stage is broken down and begins only when the previous stage has been completed (though it is not uncommon for traditional projects to cycle back to a previous stage). In addition, this methodology is most common in construction projects where the work is very linear and rarely subject to significant change (Project Management Methodologies).

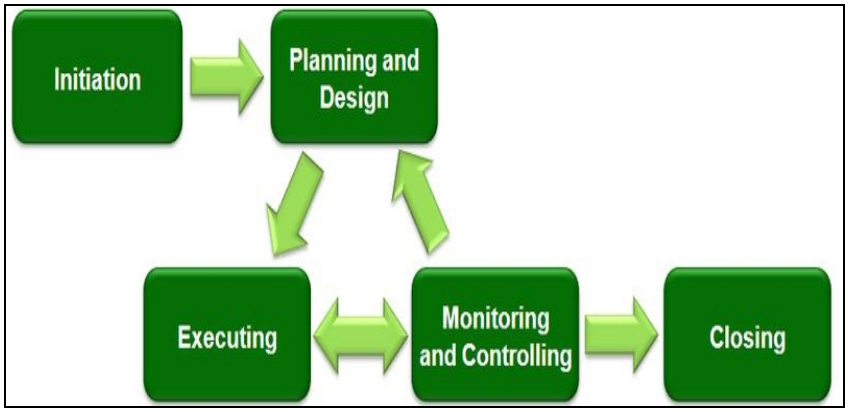

Figure 2.1 : The Traditional Phased approach

(Sources: http://en.wikipedia.org/wiki/Project_management)

Critical Path Method (CPM) in Figure 2.2, associates each task with a time duration then determines the resources necessary to carry out the project within that time. As one project management professional puts it, "The critical path is simply all the tasks that determine the end date in your project schedule. If one of those tasks is late by one day, then your project end date will be extended by one day." In other words, the critical path method aligns all tasks to bring about the greatest possible time-efficiency (Project Management Methodologies).

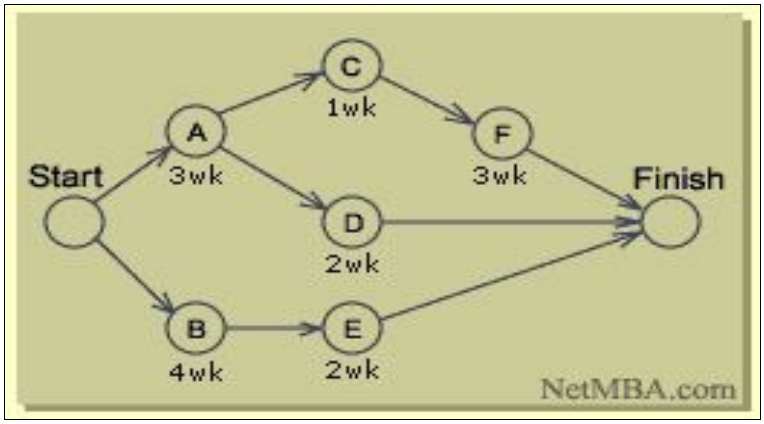

Figure 2.2: Example of CPM network diagram

(Sources: http://www.netmba.com/operations/project/cpm/)

Critical Chain Project Management (CCPM) is in contrast to the critical path method in the way that it focuses on resources rather than time constraints. The critical chain is essentially the sequence of tasks that the team members are able to efficiently handle. When a project has limited resources and its time schedules are less strict, CCPM is used to distribute work in a flexible, collaborative way (Project Management Methodologies).

While, Event Chain Methodology (ECM) is used for projects with tasks that initiate chains of events.Figure 2.3 shows the example of event chain methodology. Each task, upon completion, causes a new event in which a new task must be worked on. Because these events can be either anticipated or unanticipated, risky or safe, they must be managed very carefully in order to achieve the desired results. ECM is very different from traditional project management where each stage of the project is predetermined and executed in a linear fashion (Project Management Methodologies). Event chain methodology allows you to combine both lists to provide a simple answer to the central question of project management - how long will the project take and how much will it cost if an event occurs (Project Management using Event Chain Methodology).

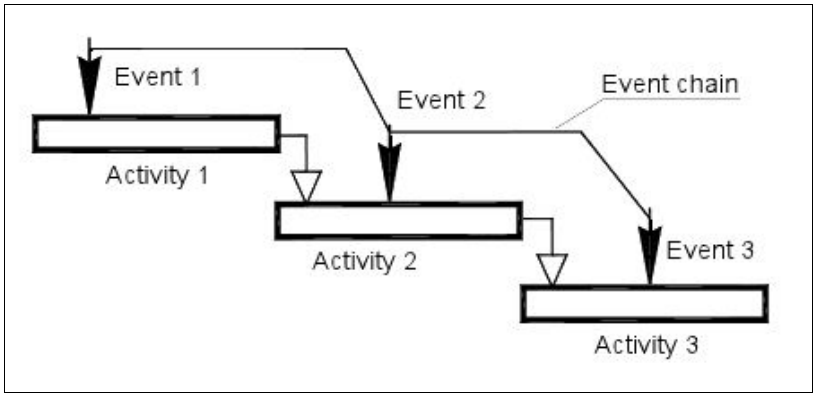

Figure 2.3: Example of Event-Chain Methodology

(Source: Virine, L. and trumper, M.)

Project Evaluation and Review Technique(PERT) which is a specialised method for identifying related and interdependent activities and events, especially where a big project may contain hundreds or thousands of connected elements. PERT is not normally relevant in simple projects, but any project of considerable size and complexity, particularly when timings and interdependency issues are crucial, can benefit from the detailed analysis enabled by PERT methods. PERT analysis commonly feeds into Critical Path Analysis and to other broader project management systems (Chapman, 1995). Figure 2.4 below show the example of a PERT diagram in a project. PERT is a variation on Critical Path Analysis that takes a slightly more skeptical view of time estimates made for each project stage. To use it, estimate the shortest possible time each activity will take, the most likely length of time, and the longest time that might be taken if the activity takes longer than expected. Formula [1] below are used to calculate the time to use for each project stage:

$$\frac{\text{Shortest time} + 4 \times \text{likely time} + \text{longest time}}{\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad} \qquad [1]$$

This helps to bias time estimates away from the unrealistically short time-scales normally assumed (Critical Path Analysis and PERT Charts : Planning & Scheduling more Complex Project(online), 1996).

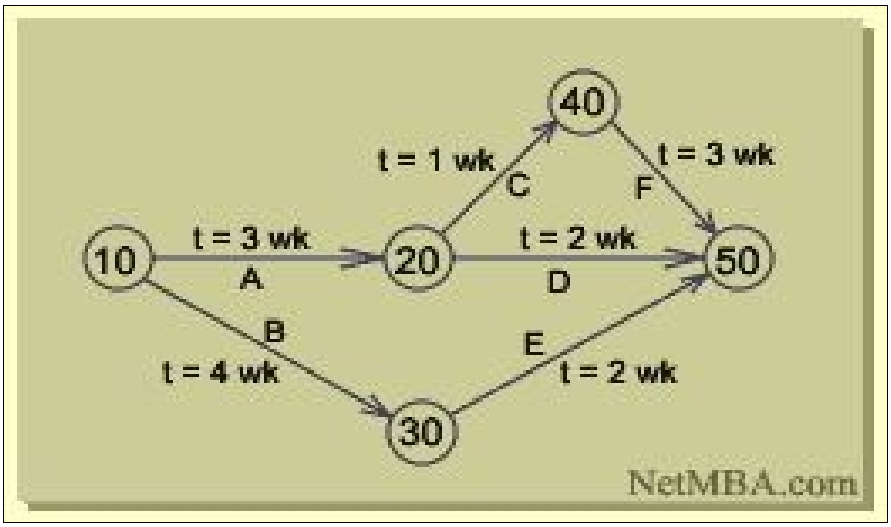

Figure 2.4 : Example of PERT diagram

(Sources: http://www.netmba.com/operations/project/pert/)

A complex project is manageable by first breaking it down into individual components in a hierarchical structure, known as the work breakdown structure (WBS) as shown in Figure 2.5. Besides, such a structure defines tasks that can be completed independently of other tasks, facilitating resource allocation, assignment of responsibility and measurement and control of the project (Work Breakdown Structure).

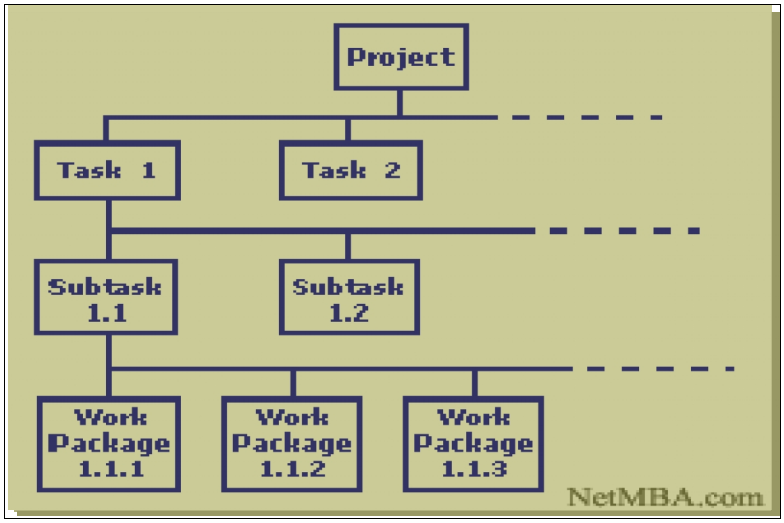

Figure 2.5: Example of Work-Breakdown Structure

(Source: http://www.netmba.com/operations/project/wbs/)

Furthermore, Gantt Charts are useful tools for analyzing and planning complex projects(in Figure 2.6). Because Gantt charts are simple to understand and easy to construct, they are used by most project managers for all but the most complex projects. Help in planning out the tasks that need to be completed, give a basis for scheduling when these tasks will be carried out, allow to plan the allocation of resources needed to complete the project, and help to work out the critical path for a project where must be complete by a particular date. When a project is under way, Gantt Charts help to monitor whether the project is on schedule (Gantt Chart).